SOLAR AND PLANETARY ROTATION.

By Pliny Earle Chase.

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The similarity in the length of day, between the principal and subordinate planets, both in the intra and the extra-asteroidal belt, is so obvious, that many attempts, of which Kirkwood's is the most satisfactory, have been made to formulate it.

I have long thought that there is some simple explanation for the rotation, as well as for the revolution of the heavenly bodies. My recent investigations of explosive gyration, have yielded some interesting results, which, from their relation to the most important bodies of our system, encourage me to hope for further and more minute developments of a like kind.

1. The sidereal revolution of the Moon : the sidereal rotation of the Earth, nearly : : the equatorial value of g at the Sun : the equatorial value of g at the Earth.

$$27.3669 \div 27.292 = 1.00275.$$

2. The action of terrestrial superficial gravity against a uniform opposing force for a sidereal half-day, would be sufficient to give a velocity equivalent to that of a planet near the Sun's surface.

$43{,}082g = 261.8164$ miles; $265.5184 \div 261.8164 = 1.01414$, which is nearly equal to 1+the Earth's orbital eccentricity.

3. The action of the superficial gravity of Jupiter for a sidereal half-rotation, would also be sufficient to give a velocity equivalent to that of a planet near the Sun's surface.

$18{,}863 \times 2.41g = 276.247$; $276.247 \div 265.5184 = 1.0406$; which is nearly equal to 1+Jupiter's orbital eccentricity.

4. The action of solar superficial gravity for a sidereal half-rotation, would give nearly the velocity of light.

$\frac{1}{2}$ of $25.1868 \times 86{,}400g = 180{,}465$; $183{,}454 \div 180{,}465 = 1.0166$.

5. The action of terrestrial gravity, near the Earth's surface, for a sidereal year, would also give a velocity equivalent to that of light.

$31{,}558{,}150g = 191{,}792$; $191{,}792 \div 183{,}454 = 1.04545$, which is nearly equal to 1+Jupiter's orbital eccentricity.

6. The orbital radius of Saturn : Mercury's orbital radius, nearly : : time of solar rotation : time of terrestrial rotation.

$$9.53885 \div .3871 = 24.642; \quad 25.187 \div 24.642 = 1.0221.$$

7. The distance of Neptune from the Sun, is nearly equivalent to one-fourth the orbit of Uranus.

$$\frac{19.182639\pi}{2} \div 30.037 = 1.00233.$$

8. The mass of the Sun : the mass of the Earth, nearly : : cube of Earth's orbital radius : cube of Sun's semi-circumference.

$$(214.86 \div \pi)^3 = 319{,}894; \quad 319{,}894 \div 314{,}000 = 1.01878.$$

9. The velocity of planetary revolution at the Sun's surface : velocity of solar rotation, nearly :: Earth's orbital radius : Sun's radius.

$$955{,}870 \div 4{,}421.7 = 216.173\,;\ 216.173 \div 214.86 = 1.00613.$$

10. The square of Jupiter's orbital radius : square of Earth's orbital radius, nearly :: g at Sun : g at Earth.

$$27.292 \div 5.2028^2 = 1.00824 \text{ (Compare No. 1).}$$

ÆTHEREAL DENSITY AND POLARITY.

By Pliny Earle Chase.

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If the conditions of equilibrium in a perfectly elastic gas have been disturbed by explosion, in the restoration of equilibrium, the particles will simultaneously rush towards each other, and towards the attractive centre m. If h is the extreme excursion consequent on the explosion, the centre of oscillation of each exploding particle being at $\frac{2h}{3}$, the centre of gyration of its return towards the centre of gaseous mass $\left(\frac{h}{2}\right)$ is at $\frac{5h}{9}$. The centre of gyration of the fall from $\frac{5h}{9}$ to the Earth, is at $\frac{5h}{27}$ above the Earth's surface, or at $r+\frac{5h}{27}$ from the Earth's centre.

If $h : r+\frac{5h}{27}$ :: the orbital *vis viva* about a diameter $\frac{5h}{9}$: the *vis viva* which would be communicated by virtual fall through $\frac{5h}{9}$ :: 1 : 4, we have $27r=103h$; $\frac{5h}{9}=d'=577.113$ miles; $\gamma=91{,}345{,}800$ miles; $\frac{r}{d}=6.8666$; $\frac{68666}{78666}\sqrt{2gd'}=6103$ feet per second. The approximation of the estimated velocity of hydrogen (6050, Clausius; 6055, Joule) to this theoretical velocity, seems to indicate that the elasticity of hydrogen is nearly perfect. The inference is strengthened by the close approximation of my first estimates by flame analysis, to the mean of the best astronomical estimates of the Sun's distance.

Let d'=density of luminiferous æther; d''=density of hydrogen. Calling the velocity of sound in hydrogen 4163 feet, and the velocity of light 183,454 miles, if the elasticities are the same we have the proportion,

$$d' : d'' :: 4163^2 : (183{,}454 \times 5280)^2 :: 1 : 54{,}130{,}000{,}000.$$

Upon the hypothesis that gravitation is an incidental result of æthereal